

Division of Agricultural Sciences UNIVERSITY OF CALIFORNIA

BREEDING YEARLING BEEF HEIFERS

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(Revised by Reuben Albaugh)



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THIS CIRCULAR

points out the economic importance to the cattle industry of breeding heifers at a young age, and of improving the environment of these animals following weaning and again after the first calf is born.

It describes how production of beef can be expanded without increasing mature breeding cattle numbers and stresses the management necessary so heifers can be bred at fifteen months of age and produce again at the age of three years.

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THE COVER PHOTO shows a group of Shorthorn-Hereford crossbred yearling heifers of breeding age. (Biggs Ranch, Butte County; photo courtesy of A. W. Mitchell.)

THE PHOTO BELOW shows a group of high-quality, well-grown-out, two-year-old heifers and their calves.



BREEDING YEARLING BEEF HEIFERS

INCREASING BEEF SUPPLIES

USDA reports that, in 1970, 29 million beef calves were produced; one half (14.5 million) were heifers. If 20 per cent, or 2,900,000 of these heifers, could be bred so that they would calve at two years of age, and if heifers would wean a 70 percent calf crop, an additional 2,030,000 calves could be produced annually. If these 2,030,000 calves could be fed out and slaughtered at an average weight of 900 pounds and a dressing percentage of 60, they would produce 1,096,200,000 pounds of dressed beef. At the consumption rate of 110 pounds per capita, this young heifer breeding program would supply sufficient beef for 9,965,454 people. At weaning these calves should average 400 pounds in weight and sell for 35c per pound at current prices or a gross total of \$140 per head. Extra feed, labor and death loss calculated at \$25 per heifer bred would leave a net income to the owner who bred yearling heifers of \$115 over the producer who breeds heifers to calve at three years of age.

Kottman (1971) estimated that simply maintaining the present per-capita consumption of 110 pounds of beef will require 8.1 million head more cows by 1985 to meet this demand. This amount of extra beef will be necessary because of increased population growth. One way of meeting this demand without increasing numbers of cattle is to feed market animals to a heavier weight. However, several studies have shown that heavier carcasses may carry more excess fat and the cost of producing beef at heavier weights will increase. This is because heavier and older animals require more feed to maintain their body weight.

In 1967, according to the USDA, 2.4 billion pounds of fat were trimmed from beef carcasses. This cost the industry 1.5 million dollars in labor, transportation, and feed. A more practical method of supplying the extra beef that will be needed in the future is to breed heifers that will calve at two rather than three years of age. This practice will not in-



crease numbers of mature breeding cows and at the same time would enhance the efficiency and income of the cattle industry.

The data presented here are based on 2,545 heifers on 15 California ranches, and on experimental results from several research stations on breeding yearling beef heifers. They demonstrate that:

- Meat production can be increased without increasing the number of mature breeding cattle.
- Greater economic returns are possible on ranches practicing the yearling breeding method.
- With proper feed, care, and management, and by weaning the calf between 4–6 months, the heifer's growth and development are not stunted; nor is the percentage of calf crop reduced at three years of age.
- Breeding heifers to calve early in the year (October, November, and December) for most of the state may reduce mortality of heifers at calving time and decrease difficulty in calving. Among the reasons for these advantages are weather, the physiological state of the heifer, or size of calf. In the mountain counties calv-

ing should occur in February and March.

- Breeding yearling heifers to young, and hence light-weight, small-bodied, small-boned bulls of another breed may result in smaller calves at birth, less difficulty at calving time and a higher percentage of calf crop. Crossbred calves can stand more stress at birth. Use of bulls from large-frame, high-growth-rate breeds is not recommended.
- Data are limited on breeding yearling heifers of the newer exotic breeds and on the use of exotic bulls with heifers of the British breeds. Until more data are available, guidelines presented in this circular may be followed with the newer, larger cattle.

TO GET BEST RESULTS

- Breed only thrifty, high-grading, fastgaining heifers weighing 600 pounds or more at breeding time and exhibiting ample femininity.
- Feed for continuous growth—to gain about 1 pound per day.
- Provide special care at calving time.
- Use young, small-bodied, smallboned bulls.
- Crossbreed where possible.

TESTS SHOW ADVANTAGES OF EARLY BREEDING

Because the prices cattlemen receive for their products are low compared to what they have to pay for goods and service, few producers can afford to delay the breeding of heifers so they calve first at three years of age. With successful management, breeding at yearling age (15 mos) shows great promise for increasing meat supplies and improving ranch production efficiency without enlarging the numbers of mature breeding animals.

Research at several experiment stations documents this statement. Oklahoma studies (Zimmerman, *et al.* 1958) showed that at 9.5 years of age, cows that calved at two produced 1.15 more calves than those bred to calve at three. Withycombe et al. (1930) in Oregon indicated that at the end of six years cows calving at two had produced 7/10's more than those first calving at three. Utah experiments (Bennett, et al. 1949) demonstrated that heifers bred as yearlings, at the end of 10 years, had produced 1.03 more calves than their herd mates that were bred to calve at three. Pinney et al. (1971) proved that, in Oklahoma at the end of 11½ years heifers that had been bred to calve first at two had produced nearly one more calf or about 338.8 pounds of calf weight.

Three main problems are connected with calving out two-year-old heifers: 1) The heifers must be managed so that they will come into sexual maturity at 12–13

TABLE 1. FEED EFFECTS ON HEIFER REPRODUCTION

		Winter grain group	
Data	1	2	3
Number of head	30	29	30
Winter gain (lb/day)	0.6	1.0	1.5
Feed required (lb/day)*			
Hay	10.2	10.6	11.4
Grain†		1.9	4.4
Summer gain (lb/day)	1.3	1.2	0.9
Body weight (lb)			
At end of winter (5/6)	414	481	558
Start of Breeding (6/15)	458	527	584
October, 15	629	667	708
Puberty age (days)	434	412	388
Percentage in heat:			
Prior to breeding season	7	31	83
During breeding season	73	66	17
After breeding season	20	3	0
Percentage bred and conceived:			
First 20 days	30	62	60
Second 20 days	10	21	20
Third 20 days	10	3	7
Not bred	20	3	0
October pregnancy (per cent)	50	86	87

* Calculated on weighted average basis.

† Ground grain mix: 70 per cent barley; 12.5 per cent linseed meal, 12.5 per cent wheat bran and 5 per cent molasses.

months of age, conceive, and calve early in the breeding season; 2) they must have the proper environment during the lactation period of their first calving; and 3) must be fed during the first gestation period so that they will calve easily.

Bergland (1959), working with 222 first-calf Hereford heifers in Montana, related the first calving date of the heifer to her lifetime production. He found that

- Heifers that produced a calf early in the calving season as a heifer continued to calve early and wean heavier calves throughout their lifetime.
- The later the calving date as a twoyear-old, the higher the probability of the cow being open later in life.
- Heifers that produced the first calf late in the calving season had a more erratic lifetime reproductive performance. The most common pattern in the erratic production was calf production in alternate years.

Bellows (1971) conducted an experiment using 89 crossbred Angus-Hereford and Hereford-Angus yearling heifers. He fed these animals in three groups during the first winter after weaning so their daily gain would be 6/10 pound, 1 pound, and 1½ pounds, respectively. They were fed from December 5 to May 6, a period of 152 days. The following summer they were grazed together on native range. Table 1 summaries the results of this test.

At the end of the grazing season, heifers fed the high ration averaged 79 lbs more in weight than those fed the lower one. Some 27 per cent of the heifers that wintered at a low rate of gain failed to come into heat during the breeding season, reducing the calf crop 20 per cent, compared to 97 and 100 per cent maximum for the groups two and three. In October all heifers were checked for pregnancy. Group one, the low-gaining lot, had 36–37 per cent less pregnancies than groups two and three. This alone points out the importance of adequate nutrition during the first winter period after weaning. Young heifers to be bred at 15 months of age after weaning should be

fed so they will gain approximately a pound a day during this period.

Bellows (1971) also conducted experiments using 62 head of crossbred Hereford-Angus yearlings. This experiment studied the effects of nutrition on the birth weights of calves, a controversial subject. All heifers in this group were bred artificially to a single Angus sire. Ninety days before calving the heifers were placed in a feedlot and fed a high- and low-level ration. Studied were cow weight changes, calf birth weights and calving difficulty.

After calving, these heifers were held in the feedlot and fed good quality alfalfa hay plus 7½ pounds of grain per head per day. The grain ration consisted of 70 per cent barley, 12.5 per cent linseed oil meal, 12.5 per cent wheat bran and 5 per cent molasses. All heifers were grazed together during the remainder of the study.

The percentage of heifers requiring assistance during calving was identical for both groups. This information agrees with the data being assembled at Ne-braska and Colorado. The calves from the group fed at a high level weighed 14 pounds more at weaning time than those from heifers on the low plane of nutrition. Only 68 per cent of the low-fed group came into heat for their second calving while 97 per cent of the high group showed estrus early in the breeding season. Table 2 summarizes these data.

To summarize these tests: Weaner heifer calves can be conditioned to be high- or low-time producers simply by manipulating the plane of nutrition during the first winter following weaning. Further results point out that feeding pregnant yearling heifers poorly from weaning to calving is false economy.

TABLE 2. EFFECTS OF GESTATION FEED LEVEL ON CALVING DIFFICULTY AND HEIFER REPRODUCTION

	Feed level last 90	days of gestation
Data	Low	High
Number of head	30	32
Feed level (lb/day)		
Hay	15	20
Grain	0	5
Heifer gain (lb/day)	0.1	1.1
Cow weight (lb)		
Initial	719	718
Precalving	725	828
24-hour postcalving	669	770
Calf data:		
Birth weight (lb)*	59	63
Calving diff. (per cent)	37	37
Average score†	1.5	1.6
Weight 6/12 (lb) (about 2 months old)	169	177
Weaning weight (lb)	348	362
Cow data: t		
Weight on 4/29 (lb)	677	758
Weight on 6/12 (lb)	753	823
Weight at calf weaning (lb)	752	811
Cow in heat for second calving before		
breeding season (per cent)	68	97

* Average of actual birthweights.

* Scoring: 1 = no difficulty to 4 = extreme difficulty, including caesarean section.‡ Cows in feedlots on estimated 16.1 lb TDN from calving to adequate range forage.

SEVEN RULES TO FOLLOW

Cattlemen who are successful in calving their heifers at two years of age rather than three consider proper feed and care very important. Data collected at several experiment stations and on 15 California ranches involving 2,545 heifers indicate that

Success for this early breeding program requires the rigid observation of the seven rules listed here:

1—Breed only thrifty, fast-gaining, highgrading heifers that weigh 600 pounds or more at breeding time, have large pelvic openings, and exhibit a high degree of femininity.

Use crossbred heifers. They come into sexual maturity early, tend to have larger pelvic openings, have a high conception rate, and exhibit less trouble at calving time. Table 3 documents this statement.

Bellows, et al. (1971) extensively studied calving difficulties among two-year-old heifers, using 95 Herefords and 103 Angus heifers. The Hereford heifers were bred artificially to an Augus bull and the Angus heifers to a Hereford bull. Calves resulting from this mating were all crossbreds.

In this test Bellows compared 14 variables that were related to calving difficulties. For the cow, they were: bodyweight at the end of the breeding season, mid-gestation and just prior to calving; weight gains during these three periods; precalving measurements of fat thickness, precondition score, and precalving pelvic height, width and area.

For the calf, the difficulties were: gestation length, sex, and birth weight.

Factors that contributed to most of the difficulties were pre-calving calving weight of the dam, pelvic area, sex of calf, and birth weight of the calf. Factors that contributed most to the birth weight of the calf were: pre-calving weight of the dam, gestation length, and sex of calf. In other words, big cows tend to have less trouble calving than smaller ones, even though their calves were heavier at birth. Bull calves were heavier at birth and consequently caused more difficulty at calving time. Cows with larger pelvic openings had less calving difficulties than those that were smaller. Longer gestation resulted in larger calves at birth.

Experiments are being conducted in which pelvic openings of young heifers prior to breeding are measured. If the results of these studies indicate heifers with larger pelvic openings at this young age have less calving difficulties, this will be another measuring stick for culling and selecting replacement breeding heifers.

Breed group	Number	Age	Weight	Pelvic area
Straightbred:		days	pounds	sq. cm.
Angus	14	360	588	153.0
Hereford	16	386	596	157.2
Charolais	23	370	700	189.0
Crossbred:*				
A X H	34	368	585	159.3
A X C	39	370	649	174.0
H X C	28	374	648	176.8
A X BS	5	330	631	168.8
H X BS	7	344	638	171.6
C X BS	9	333	674	176.2

TABLE 3. STRAIGHTBRED AND CROSSBRED HEIFERS COMPARED

* A = Angus; H = Hereford; C = Charolais; BS = Brown Swiss. Source: Bellows (1971).



Above: Young small-bodied and small-boned Hereford bull, a good type to breed to yearling heifers. Calves from this mating should not be kept for breeding but should be sold for beef.

Below: A good type Angus bull for breeding to young heifers.



2—Keep heifers in thrifty growing condition by supplementary feeding during the short dry-grass season.

In California it is a good nutritional plan to feed the heifer for continuous growth after she is weaned and until she is approximately two and one half years old. On most ranches, these large heifers are selected at weaning time and then supplemented on the range with approximately 1 to 1½ pounds of cottonseed cake per head per day until the range grass will furnish adequate nutrients for good gains. Heifers fed on the range in this manner should gain from ¾ to 1 pound per head per day, which is sufficient for breeding animals.

In the mountain areas, where heifers are wintered in the feedyard, a couple of pounds of concentrates per head per day plus good legume or mixed legume hay, fed free choice, will provide adequate gains.

In the early fall, after the heifers have been bred as yearlings, supplement them on the range with cottonseed cake or some other high-protein feed until the grass is again adequate to keep them supplied with proper nutrients. On some ranches where permanent irrigated pasture is available, the only supplementary feed necessary is some roughage, such as hay, to prevent bloat and scouring.

Under feedlot conditions in the northern counties, supplying these heifers with 20–25 pounds of good-quality alfalfa or mixed legume hay will give them the proper plane of nutrition for adequate growth. Two-year-old heifers, at the time they wean their first calves should weigh about 800 pounds.

After calving, a two-year-old cow will require 28 pounds of feed containing 1.4 pounds protein, 16.18 pounds TDN, 30 grams calcium, 23 grams phosphorus, 14 grams magnesium, and 42,000 I.U. vitamin A. A ration that will meet these requirements is 28 pounds alfalfa hay or 30 pounds of mixed legume hay.

3—Breed heifers to small-bodied, smallboned, young bulls.

Small-bodied, small-boned bulls tend

to sire calves that are small at birth. This is important in this early breeding program because it prevents losses of both calves and heifers and saves time and labor. Young bulls are recommended, not because they usually sire calves which are lighter in weight, but because these young bulls are small, and are not apt to injure the heifers at breeding time. Keep and use bulls which continue to sire calves that are small yet thrifty and vigorous at birth as long as possible, regardless of age, type, or breed.

Some cattlemen who practice this early breeding method use small-bodied, smallboned Angus bulls on Hereford heifers, because they believe the calf resulting from this cross is smaller at birth, is more vigorous, and produces a more efficient feeder animal.

In 1942, 46 Hereford heifers on one ranch in Monterey County were bred to two Angus bulls. Forty-two crossbred calves were raised and sold for veal. They were popular with the packer and brought top prices. No losses of cows or calves occurred. Other breeds producing small calves at birth are the Texas Longhorn and the Jersey.

Work at the Ohio Experiment Station (table 4) indicated that the gestation period of Aberdeen-Angus cows is about ten days shorter than that of Hereford cows. This shorter gestation period may have some bearing on the theory that the crossbred Angus-Hereford calf is smaller at birth.

In this test, 101 gestation periods for purebred Angus calves averaged 276.47 days; for 100 purebred Hereford calves, 286.28 days; for 94 crossbred Hereford-Angus calves. 281.98 days; for 102 crossbred Angus-Hereford calves 283.30 days.

The Oaklahoma Station at Stillwater, Oklahoma, established a test to compare Augus bulls on Hereford heifers to Hereford bulls on Hereford heifers. Twentythree Hereford heifers, averaging 474 pounds at 441 days of age, were placed in a pasture with an Angus bull. A similar number of heifers of the same weight and age were placed in a pasture with a Hereford bull. Both bulls were classed as medium-to-small in size and were considered comparable in that respect. The



A two-year-old Angus bull and yearling heifer.

results of the test are presented in table 5. A study of these data reveals that

- Crossbred calves were calved about five days earlier than the straight Hereford calves.
- The crossbred calves were 6 pounds lighter at birth.
- A larger number of crossbred calves were weaned.
- At weaning time, crossbred calves were 17 pounds heavier.
- A larger number of the cows raising crossbred calves were pregnant at weaning time, although all cows had been exposed to the same bulls for the same period of time.

One cattleman in Monterey County bred yearling Hereford heifers to a Brahman bull with fair results. This project, carried on for two years, showed that the calves were smaller at birth than straight Herefords, and little trouble was experienced at calving time. The average birth weight of a representative group of crossbred Brahman-Hereford calves was 62 pounds. These calves made excellent veal and were popular with the packer. They brought a higher price per pound than did straight Hereford calves of similar age. The test included 71 heifers, and a 49.3 per cent calf crop was sold. This low calf crop may have been due to low rainfall causing short feed conditions.

4—Wean calves from the two-year-old heifers between 4 and 6 months.

When the calf is weaned at this age, the cow has a chance to grow and develop. Weaning these calves early *may* help prevent the occurrence of nonbreeders and insures a large calf crop when the heifers are three years of age. In areas of adequate feed supply heifers not bred until two years of age may become too fat. This could impair their productive performance by reducing milk supply and causing difficult calving.

Observations on one ranch in Monterey County showed that the percentage of calf crop from three-year-old heifers was 10 per cent higher on heifers that calved at two years than on those that calved for the first time as three-yearolds.

The 12-years average percentage of calf crop on this ranch for mature cows was 89.64 per cent. The observations covered about 500 breeding cows per year. Had TABLE 4--EIGHT-YEAR SUMMARY OF CROSSBREEDING EXPERIMENT, OHIO AGRICULTURAL EXPERIMENT STATION,

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				Calves from	Angus	COWS					Ca	lves from F	Ierefo	rd cows		
Data		Ma	les			Fei	nales			Ma	les			Fen	ales	
	Pt	urebred Angus	Cr Heref	ossbred ford-Angus	Pu	urebred	Cr Heref	ossbred ord-Angus	Pu H	rebred	Cre	ssbred -Hereford	ЧН	urebred ereford	Cr Angu	ossbred s-Hereford
	*		*		*		*		*		*		*		*	
station period, days	53	277.2	52	282.7	48	275.7	42	281.1	47	287.5	48	283.1	53	285.2	54	283.5
rth weights, lb	53	62.4	52	65.9	48	56.1	42	62.7	50	69.2	48	67.0	54	67.8	54	62.6
eaning weights, lb	49	486.2	50	472.6	42	419.7	42	446.9	46	393.7	46	432.4	51	385.7	48	394.3
e at weaning, days	49	234.7	50	227.3	42	228.7	42	225.5	46	218.7	46	223.6	51	219.2	48	217.9
erage daily gain, birth																
to weaning, lb.	49	1.80	50	1.79	42	1.59	42	1.70	46	1.48	46	1.63	51	1.45	48	1.52
erage daily gain on pas-																
ture last 4 years only,																
150 days, lb	18	1.02	23	1.02	8	.85	23	.92	22	1.08	52	1.10	25	1.09	24	1.07
150 days, lb	18	1.02	23	1.02	20	.85	23	.92	22	1.05	~	3 22	3 22 1.10	3 22 1.10 25	3 22 1.10 25 1.09	3 22 1.10 25 1.09 24

* Figures in these columns refer to number of calves used in calculations.

TABLE 5—SUMMARY OF THE CALVING PERFORMANCE OF TWO-YEAR-OLD HEREFORD HEIFERS BRED TO HEREFORD AND ANGUS BULLS AT STILLWATER, OKLAHOMA*

	Heref	ord Bull	Angu	s Bull
	N	umber of cows	bred to each b	all
	2	23	2	3
Sex of calf	Male	Female	Male	Female
Number of calves born	9	11	14	8
Average birth weight (lb.)	64	63	60	55
Number of calves pulled	2	4	5	0
Number of calves lost at calving	2	1	0	0
Number of cows lost at calving	1	1	0	0
Number of calves weaned	7	10	14	8
Average birth date of calves	April 13	April 2	April 6	March 26
Average weaning weight of calves	_	-	-	
(10-4-51)	331	314	338	339
Average weight of cows raising calves	800	824	808	882
Number of cows found pregnant (10-4-51)	5	7	11	8

* This work was conducted at the Oklahoma A. & M. Experiment Station, Stillwater, Oklahoma, by Doyle Chambers, Associate Professor of Animal Husbandry, and J. A. Whatley, Jr., Associate Professor of Animal Husbandry.

the breeding of the yearling heifers interfered with their ability to conceive as twoyear-olds, this percentage of calf crop would have been materially lower. These heifers were about 27 months of age when their first calves were weaned. Their average weight was 803 pounds at that time, indicating that breeding them as yearlings did not stunt their growth nor retard their future production.

These excellent yearling heifers averaged 671 pounds when bred to a Brahman bull.



 TABLE
 6.----SUMMARY
 OF
 9½
 YEARS
 RESULTS
 IN
 LONG-TIME
 STUDY
 WITH
 BEEF
 COWS

 WINTERED
 AT
 DIFFERENT
 LEVELS
 (1948–1957).

Age at first calving Lot number Level of winter supplement	1 Low	Two-year-olds 3 Med.	5 High	2 Low	Three-year-olds 4 Med.	6 High
No. of cows at start of experiment	15	15	15	15	15	15
No. remaining on test Nov. 1957	14	13	6	13	10	12
Ave. weight changes of cows on test (lbs.) Initial weight 10/29/48 Ave. winter weight loss Ave. summer gain Final wei 11/1/57	473 -98 172	471 108 181	476 -64 142	476 101 180	461 -98 169	470 71 152
Calf production records at 91/2 yrs. of age. Heifers assisted at first calving. Calves lost at first calving. Total number of calves weaned.	6 104 104 913	106 938 938	4 4 4 85 876	95 95 860	881 88	2 848 848
Total no. of calves weaned/cow	7.30	7.50	7.01	6.72	6.03	5.94
Average calving date	3/15	3/8	3/9	3/16	3/6	3/5
Average calf weights (lbs.) At birth (corrected for sex) At weaning (corrected for age and sex)	76.8 480	76.5 476	78.4 477	77.0 494	77.8 474	78.3 492
Total feed, pasture and mineral cost/cow (\$).	254.55	337.54	453.84	254.55	337.54	453.84
Cow cost per cwt. calf weaned	7.27	9.45	13.74	7.66	11.80	15.53

Based on the total number of cows remaining on test and bred to calve in each year

Zimmerman *et al.* (1958) compared the lifetime performance of heifers bred to calve at two years of age to those that calved first at three years and were fed different levels of winter feeding. Table 6 gives the results of this 9½ year study.

These results show that age of breeding or amount of supplementary feeding did not alter the final mature weights of these animals.

Cows at the Union Station in Oregon that had calved as two-year-olds produced a 79.6 per cent calf crop at three years of age. At four years, the percentage of calf crop was 86.1, at five years 94.7, and at six years 83.3.

Many authorities believe that milk production is the principal stress limiting growth in these young heifers, and therefore it is strongly recommended that they receive proper nutrition and care until the second calf is weaned. Under droughtlike conditions, calves on two-year-old heifers can be creep-fed or sold as veal at about three months of age. Evidence accumulated by S. W. Mead at the University of California Experiment Station, Davis, shows that weaning the calf at three months has no retarding effect on the future milk production of the cow.

The following paragraph taken from Roscoe R. Snapp's book *Beef Cattle* may help to explain this theory: "There is much evidence that gestation has a less stunting effect upon immature heifers than has lactation. This statement seems reasonable in view of the fact that the new-born calf contains only about 15 pounds of protein and 3 pounds of fat, whereas about 65 pounds of protein, 70 pounds of fat, and 90 pounds of carbohydrates are in the milk produced by the young mother during the first 4 months of lactation."

5—Give special care and attention to the heifers at calving time.

When young heifers are ready to calve, place them in small fields equipped with corrals and other facilities for restraining and handling cases of difficult calving. Have an experienced person watch them closely. Drive any heifer having difficulty slowly and carefully into one of these small corrals, where assistance can be given.

The calf-puller (see photo) is a valuable piece of equipment for anyone employing this early breeding program. Use the calf-puller carefully and intelligently. Nasco-West in Modesto, California, is one company carrying this product.

Work conducted by Bellows (1971) indicated that out of 6,409 calvings, 380 calves died-75 per cent of this death loss occurred at birth. In this 10-year study the cows calved on the open range for the first six years, and calf loss was 9.5 per cent in first-calf heifers. 4.3 per cent in 4-year-olds; and 2.4 per cent in cows 5 years or older. During the last four years of this test, cows were managed in small enclosures and 2-3-year-old heifers were watched closely during calving season. Losses dropped to 6.4 per cent in 3year-old heifers and 4.3 per cent in 2year-olds. Bellows concludes that most calf losses can be prevented if cattlemen make closer observations and give more assistance to cows during calving time.

6—Breed heifers so that most will calve during September–December (later in the cold, high country).

Schoonover (1969) suggests that yearling heifers be bred from one month to six weeks earlier than the main breeding herd. If this is practiced, future calving dates of these heifers will be similar to those of the main herd. The reason these young heifers need a longer breeding season is because it will take them longer to recover from the stress of calving than older cows.

When the average calving date is delayed 30 days, it is equivalent to reducing calf crop by 10 per cent which may lower the net profit by 25 per cent. Putting it another way, each time a cow misses a heat period (21 days), it is going to cost the operator about \$10 (Pope, 1971).

On most California cattle ranches these young heifers are now bred to calve during September, October, November and December. In the mountain counties where spring calves are desired, February and March are the recommended months.



Calf puller in operation—a valuable piece of equipment for a cattle ranch. Operator must be sure the calf is in correct position for delivery before applying puller. If in doubt, call a veterinarian.

A sixteen-year yearling heifer breeding program on a ranch in Monterey County is summarized in table 7.

7—Breed only a few heifers the first year of the program to allow operator to gain experience.

Results of field tests secured on 15 California ranches (table 8) demonstrated that beef production and economic returns can be increased, when beef heifers are bred to calve at two years of age. These data, coming from 2,545 heifers, producing 1,718 calves and including 16 years of records on one ranch, show a total production of 486,194 pounds or 243 tons of meat with a gross return of \$108, 420.26. The average return of these heifers as two-year-olds was \$59.00 for TABLE 7-SUMMARY OF A SIXTEEN YEAR YEARLING HEIFER BREEDING PROGRAM ON ONE RANCH IN **MONTEREY COUNTY***

r calved	Value	\$16	34	87	54	65	102	11	\$51
Per heife	Pounds sold	170	216	312	258	261	308	217	275
er bred	Value	\$11	26	99	46	64	06	62	\$32
Per heif	Pounds sold	119	166	235	217	258	273	189	169
Average	price per cwt.	\$ 9.32	15.75	28.00	21.00	25.00	33.00	32.80	\$ 18.15
Average	calves sold	222	234	338	269	274	321	268	269
Per cent	calf crop sold	53	69	69	81	94	85	20	65
Per cent	calves died	23.6	7.9	7.8	4.1	4.8	3.9	18.8	14.9
f heifers	Died	4.1	6.	1.2	2.3	0	2.3	0	2.4
Per cent o	Calved	70	75	75	85	66	88	87	77
	Kind of bull	Hereford—2-yr.	Hereford-2-yr.	Hereford-2-yr.	Hereford—2-yr.	Hereford-2-yr.	Hereford-2-yr.	Hereford-2-yr.	
	Month bred	Apr-June	Feb.	Feb.	Feb.	Feb.	Feb.	Feb.	
Number	heifers bred	677	339	85	86	84	87	153	1511
	Year	1937-43	1944-47	1948	1949	1950	1951	1952	Total Average

* These data were accumulated by Rudolph Asmus, Manager, of the El Sur Ranch, Monterey, California.

TABLE 8-SUMMARY OF RESULTS OF BREEDING YEARLING HEIFERS IN CALIFORNIA

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nber Number Weight	umber Weight	Weight	 Month	Kind of	Per ce	ers	Per cent	Per cent	Average weight	Average	Per h bre	eifer sd	Per h calv	ed
ches bred breeding	bred breeding	breeding	 bred	llud	Calved	Died calving	died	sold	sold	purce per cwt.	Pounds sold	Value	Pounds sold	Value
4 136 600-750	136 600-750	300–750	 April Sept.	Hereford Angus Charbray	•	0		88	547	\$ 35.00	483	\$169	:	
1 245 650-750	245 650-750	350-750	 Feb Mar.	Angus	06	1.2	13.6	78	425	31.10	330	103	368	\$114
6 1,925 580-670	925 580-670	680-670	Feb. June	Hereford Angus Brahman	77	2.4	14.9	99	243	16.60	160	27	229	42
1 63 650	63 650	650	Sept. Nov.	Hereford	95	3.2	25.0	71	443	35.00	316	111	332	116
1 109 700	109 700	002	Jan.	Angus	:	0	:	86	366	33.50	316	106	•	:
1 67 600	67 600	600	Apr. May	Angus	86	0	28.8	70	445	35.90	311	112	317	114
2,545 580-750	545 580-750	80-750			87	2.1	15.6	67	283	22.30	193	43	257	29

County	Number heifers bred	Per cent died calving	Loss per heifer bred*
Imperial	136 245	0 1.2	\$.00 1.84
Monterey	1,925	2.4 3.2	2.22
Stanislaus	109	0	0
Sutter	67	0	0
Total Average	2,545	2.1	\$ 2.05

TABLE 9-VALUE LOST THROUGH MORTALITY OF HEIFERS

* Losses were based on the following valuations per heifer died.

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each heifer which produced a calf. The majority of these calves were sold between 1943–1947 at an average price of \$16.60 per hundredweight. Based on 1971 prices (\$40.00/cwt), the average return per heifer would be about \$97.20. The average production per heifer bred amounted to 193 pounds, or 247 pounds per heifer calved. The average mortality of heifers at calving time was 2.1 per cent. This amounted to \$2.05 loss per heifer bred (table 9). The percentage of calf crop sold averaged 67 per cent. Loss of calves from calving to veal age was 15.6 per cent. The Oregon Experiment Station at Union found that beef cows which first calved at two years were more profitable than those which first calved at three. The difference between the two groups at the end of four years was \$36.15 per head. At the end of six and one-half years, the cows that had calved first at two years had produced .7 more calves than those first calving at three. When five years old, the cows that had calved at two years were about 100 pounds lighter than those first calving at three; but they were producing as many calves of an equal size, and so were just as valuable

Braford calves raised by two-year-old Hereford heifers. The calves are about 2 months of age.



from the breeding standpoint. The possible reason these early bred cows were lighter in weight at the end of five years was because their calves were allowed to nurse until they were from six to seven months of age.

The Utah Experiment Station at Logan, Utah, presents the following data regarding breeding of range Hereford heifers as yearlings to a Hereford bull:

- Calving at two years of age did not stunt range cows that were well fed during the winter.
- Conception rate was not high in yearling range heifers, especially in smaller and younger ones.
- Heifers calving at two years of age had difficulty in calving.
- When both groups were six years of age, cows calving first at two years. weaned an aveage of 1.03 more calves that were 10 pounds heavier

than did cows that calved first at three years of age.

• In the fall, when both groups were six years old, the early calving group had weaned an average of 1,236 pounds of calf per cow compared to 865 pounds of calf per cow for the group that calved first at three years. The difference of 371 pounds in favor of early breeding was a result of the cows raising an average of 1.03 more calves per cow and the calves averaging 10 pounds more in weight.

The workers conducting this study suggest that if animals are small, or if the operator cannot give them proper attention during calving, the practice of breeding yearling heifers should not be recommended. Ranchers should not breed heifers as yearlings unless adequate feed supplies are available to grow the heifers out to a large size at the time of calving.

Below, left. Two-year-old Hereford heifer with three-months-old calf. Photo on right shows crossbred Angus-Hereford calves from two-year-old heifers (average 243 pounds). Calves from this cross are usually polled and black-bodied with a white or mottled face.



SUMMARY

These data on breeding yearling beef heifers as secured under field conditions in California and researched at several experiment stations have led many authorities to believe that this type of breeding program will increase the efficiency on many beef cattle ranches without increasing numbers of breeding animals. Adequate nutrition and proper care and management must be provided. The program shows the possibility of increasing the size and quality of the calf from the heifer when she calves the second time (three years of age), and it affords a natural method of selecting a cow herd of good mothers. Some breeders who are practicing breeding of yearling heifers have observed that these young heifers take better care of their calves and produce more milk than those that fail to breed earlier. There are no experimental data presently available to support these observations.

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